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Pesticide Fact Sheet Number 91.1: Arsenic Acid (H3AsO4)

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16. Abstract (Limit: 200 words)

This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the following actions has occurred.

1. Issuance or reinssuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

17. Document Analysis a. Descriptors

Pesticides, regulations, Chemical Information Fact Sheet, Use Patterns, science findings.

b. Identifiers/Open-Ended Terms

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EPA

Pesticide Fact Sheet

Name of Chemical:	Arsenic Acid (H_3AsO_4)
Reason for Issuance:	Preliminary Determination
Date Issued:	September 1991
Fact Sheet Number:	91.1

I. DESCRIPTION OF CHEMICAL

COMMON NAME: Arsenic acid, orthoarsenic acid
CHEMICAL NAME: Arsenic acid
TRADE NAMES: Desiccant L-10, Poly Brand Desiccant, Hi Yield
EPA SHAUGHNESSY CODE: 006801
CHEMICAL ABSTRACTS SERVICE (CAS) NUMBER: 7778-39-4
PESTICIDE TYPE: Desiccant
PESTICIDE FAMILY: Inorganic arsenicals
U.S. AND FOREIGN PRODUCERS: Pennwalt Division of Atochem

II. USE PATTERNS

Arsenic acid is used on stripper-picked cotton as a desiccant. Use is limited to areas of Oklahoma and Texas where this type of cotton is grown. Arsenic acid is formulated as a 75% soluble concentrate intermediate and as an end use product. Arsenic acid is applied to cotton at a rate of 2.94 to 4.42 pounds active ingredient per acre as a foliar spray four to ten days prior to harvest. Arsenic acid is applied by either ground boom or by aerial application.

III. SCIENTIFIC FINDINGS

- CHEMICAL CHARACTERISTICS

Physical state - Aqueous solution
Oxidation state - pentavalent (As +5)
Specific Gravity - 1.884 at 20°C
Solubility - Readily soluble in water, forming various arsenic salts.
Stability - Most stable under conditions favoring oxidation and at high pH; pentavalent form may convert to trivalent arsenic under reduction conditions or low pH or other conditions which reduce pentavalent arsenic to trivalent arsenic. Reacts with galvanized metals, black iron and certain other metals resulting in deterioration, corrosion or liberation of toxic gasses.

- TOXICOLOGICAL CHARACTERISTICS

Acute Toxicity

Although arsenic is known to be highly toxic by ingestion, few animal studies are available on arsenic acid. Oral rat studies show LD 50 as 40-100 mg/kg; however, rodents are not a good test species since they retain arsenic in their bodies (The LD 50 is the dose which is lethal to 50% of the test population.). Humans are known to be more sensitive to acute arsenic effects than rodents.

Carcinogenicity

Arsenic acid is classified as a Class A, or known human, carcinogen. This classification is based on epidemiological studies on workers who are exposed to airborne inorganic arsenic at smelters and in pesticide manufacturing plants. Inhalation exposure leads to lung cancers. In addition, high levels of inorganic arsenic in well water in Taiwan have been linked to skin cancers.

Lifetime worker risk estimates from exposure to arsenic acid, which is classified as a known human carcinogen, are as high as 2 in 100 (2×10^{-2}). Area residents are potentially at risk due to exposure from application and to arsenic-laden cotton debris.

Other

The weight of the evidence indicates that inorganic arsenicals are mutagens. Although there is teratogenic and fetotoxic potential based on intravenous (administrered into the veins) and intraperitoneal (administrered through the stomach walls) routes of exposure, there is insufficient evidence by the oral route to confirm arsenic's teratogenic or fetotoxic effects. Neurotoxic effects have been demonstrated after acute, subchronic and chronic exposures. The metabolism of arsenic in humans is well-documented, but animal studies are not adequate to determine no effect levels (NOELS) and acceptable daily intakes (ADIs).

- ENVIRONMENTAL CHARACTERISTICS

Arsenic is a naturally occurring compound that is ubiquitous and exists in many forms depending on environmental conditions. Arsenic acid dissolves readily in water. When analyzing the environmental fate of arsenic, natural arsenic cannot be distinguished from pesticidal sources.

The potential for arsenic acid to contaminate ground water has not been ruled out. The Texas Department of Agriculture has

found levels of arsenic in well water above the maximum contaminant level of 50 per billion, and has concluded that, in addition to natural arsenic sources of contamination, pesticidal application of arsenic has contributed to the well water contamination.

IV. BACKGROUND

The inorganic arsenicals, including arsenic acid, were placed into Special Review in 1978. EPA separated the wood preservative uses of inorganic acid from the non-wood uses and, after requiring strict risk reduction measures, retained the registrations for those uses. In 1988, EPA banned virtually all uses of non-wood preservative products containing inorganic arsenic, deferring regulation on four inorganic arsenical compounds (including arsenic acid on cotton) until questions on chronic exposures could be addressed. Since then, the registrations of the other uses: lead arsenate on citrus, calcium arsenate on turf, sodium arsenite on grapes, and the state registration of arsenic acid on okra, have been voluntarily cancelled. Thus, the only non-wood preservative inorganic arsenical use remaining for Special Review consideration is arsenic acid.

V. REGULATORY POSITION AND RATIONALE

EPA is proposing cancellation of the use of arsenic acid as a desiccant on cotton with no provisions for existing stocks. In addition, EPA is proposing to conclude the Special Reviews of the remaining inorganic arsenicals, which have been voluntarily cancelled: arsenic acid as a desiccant on okra, calcium arsenate on turf, lead arsenate on citrus and sodium arsenite on grapes. The rationale for the proposal is as follows:

- Arsenic acid is a known human (Group A) carcinogen;
- Lifetime cancer risks as high as 2 x 10-2 have been estimated for certain workers. EPA has concluded there are no practical means of mitigating this risk;
- In addition to workers, residents in the vicinity of cotton fields and gins are exposed to varying amounts of arsenic acid. EPA's Office of Air Quality Planning and Standards has estimated area resident risk to be 10-4.
- For existing stocks, EPA has concluded the limited benefits of allowing time to switch to alternative desiccants are not outweighed by the risks.

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